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**Datasheet for the decision
of 1 December 2010**

Case Number: T 0355/09 - 3.3.06

Application Number: 97903409.7

Publication Number: 0882152

IPC: D21C 9/10

Language of the proceedings: EN

Title of invention:

Process for bleaching of a high yield pulp

Patentee:

Kemira Oyj

Opponents:

Ciba Specialty Chemicals Oy
BASF SE

Headword:

High yield pulp bleaching/KEMIRA OYJ

Relevant legal provisions:

EPC Art. 56

Relevant legal provisions (EPC 1973):

-

Keyword:

"Inventive step (all requests): no - obvious use of alternative chelating agents because of their known technical properties"

Decisions cited:

-

Catchword:

-



Case Number: T 0355/09 - 3.3.06

D E C I S I O N
of the Technical Board of Appeal 3.3.06
of 1 December 2010

Appellant: Kemira Oyj
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Representative: -

Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 11 December 2008
revoking European patent No. 0882152 pursuant
to Article 102(1) EPC 1973.

Composition of the Board:

Chairman: P.-P. Bracke
Members: L. Li Voti
J. Van Moer

The following documents were cited in writing:

- (1): WO94/03553;
- (2): WO95/12029;
- (3): WO95/14808;
- (7): US-A-5227022 and
- (8): US-A-5296100

III. As regards the inventive step of the subject-matter of claim 1 as granted, the Opposition Division found in its decision that

- document (2), relating to a two-steps bleaching process of the same type of the present invention, represented the closest prior art;
- the combination of features of claim 1 as granted did not provide any improvement in brightness with respect to a process using diethylene triamine penta acetic acid (**DTPA**) as chelating agent;
- the technical problem solved by the claimed invention thus was the provision of an alternative chelating agent more biodegradable than **DTPA** for such a two-step bleaching process;
- therefore, starting from the teaching of document (2) it would have been obvious for the skilled person to try the known biodegradable chelating agents of document (3) in a process as disclosed in document (2) as alternative to the phosphonates used in that document.

Moreover, the additional technical features of claim 1 according to then pending first, second and third auxiliary requests were already known or suggested from document (2) and could not support the presence of an inventive step.

As regards claim 1 according to then pending fourth auxiliary request, the Opposition Division found that document (1) disclosed the use of ethylenediamine-N,N'-disuccinic acid as biodegradable chelating agent in the bleaching of mechanical and chemical wood pulp; therefore, starting from the teaching of document (2), it would have been obvious for the skilled person to try the biodegradable chelating agents of document (1) as alternative to the phosphonates used in document (2).

Therefore, all the then pending requests lacked an inventive step.

IV. An appeal was filed against this decision by the Patent Proprietor (Appellant). With the statement of the grounds of appeal the Appellant submitted amended sets of claims as auxiliary requests 1 to 4 and an experimental report as Annex 1.

With the letter of 3 September 2010 the Appellant informed the Board that he would not attend the oral proceedings.

Oral proceedings were held before the Board on 1 December 2010 in the presence of Respondent 02 (Opponent 02) only.

Respondent 01 (Opponent 01) did not submit any argument in reply to the grounds of appeal.

- V. Claim 1 of the set of claims according to the auxiliary request 1 differs from claim 1 as granted only insofar as it requires the further step of compressing the pretreated pulp to the consistency used in peroxide bleaching.

Claim 1 of the set of claims according to the auxiliary request 2 differs from claim 1 as granted insofar as the chelating agent is selected from the group consisting of ethylenediamine-N,N'-disuccinic acid and/or an alkali metal salt or an earth-alkali metal salt thereof, wherein the alkali metal or earth-alkali metal is selected from the group consisting of Na, K, Ca and Mg (hereinafter referred to as **EDDS**), and 2,2'-iminodisuccinic acid and/or an alkali metal salt and/or earth-alkali metal salt thereof, wherein the alkali metal or earth-alkali metal is selected from the group consisting of Na, K, Ca and Mg (hereinafter referred to as **ISA**), and is used together with a hydroxycarboxylic acid having the formula (II)



where n is 1-8, m is 0-2n, p is 0-n, q is 0-2, R₁ is COOH, and R₂ is H, CH₂OH or COOH.

Claim 1 of the set of claims according to the auxiliary request 3 differs from claim 1 according to the auxiliary request 2 only insofar as it requires the

further step of compressing the pretreated pulp to the consistency used in peroxide bleaching.

Claim 1 of the set of claims according to the auxiliary request 4 differs from claim 1 according to the auxiliary request 3 only insofar as the chelating agent is **EDDS**.

VI. As regards the inventive step of the claimed subject-matter, the Appellant submitted in writing the following:

- (a) - the subject-matter of claim 1 of the patent as granted differed from the process of document (2), representing the closest prior art, in that different chelating agents were used in the pre-treatment step;
 - starting from the teaching of document (2), the technical problem underlying the invention was the provision of an alternative process for the bleaching of a high yield mechanical pulp or recycled fiber in the presence of a phosphorous-free biodegradable chelating agent;
 - the tests presented as annex 1 confirmed the improvement in wood pulp bleaching in terms of brightness and efficacy achieved by means of the chelating agents selected in the patent in suit;
 - the skilled person, looking for alternative biodegradable chelating agents, would refer to conventionally known biodegradable chelating agents which had been already employed in the

bleaching of high yield mechanical pulp or recycled fibers, such as citric acid disclosed in document (7);

- moreover, document (3) relating to the use in wood pulp bleaching of biodegradable chelating agents of a generic formula encompassing **ISA**, did not disclose the use of such a chelating agent in a pre-treatment step of a process for bleaching high yield mechanical pulp; therefore, the skilled person would not have combined the teaching of document (3) with that of document (2) or with that of any of documents (7) or (8) for solving the technical problem underlying the invention;

- (b) document (2) did not disclose the step of removing after pre-treatment the resulting metal-ligand complexes by compressing the pulp to higher consistency as required in the auxiliary requests 1 and 3, which step brought about the advantage of reducing the amount of metal complexes capable of catalyzing the decomposition of hydrogen peroxide in the bleaching step;
- (c) by using hydroxycarboxylic acids in the pre-treatment step as required in claim 1 of the auxiliary requests 2 and 3 the amounts of **EDDS** or **ISA** were replaced with chelating agents which did not contain nitrogen; therefore the environmentally detrimental load of nitrogen in effluents from bleaching was reduced;
- (d) document (1) disclosed generically the use of **EDDS** in the bleaching of wood pulp but did not disclose

anywhere a process for bleaching high yield mechanical pulp or recycled fiber wherein a chelating agent was used in a pre-treatment step;

- as shown in the tests of annex 1, the use of **EDDS** or **ISA** in the pre-treatment led to an improvement in terms of brightness and bleaching efficacy even though such chelating agents were ineffective at alkaline pH;

- therefore, in the light of the teaching of document (1), the skilled person would not have expected such an improved bleaching performance by using **EDDS** in the pre-treatment step carried out at a lower pH than the bleaching step.

The claimed subject-matter thus involved an inventive step.

VII. The Respondent 02 submitted in writing and orally *inter alia* that

- document (2) represented the closest prior art;

- the tests contained in annex 1 did not contain any comparison with a process according to the closest prior art but just between a two-steps bleaching process and a one step process; therefore, the results of these tests were of no relevance for the evaluation of inventive step;

- the technical problem underlying the invention could only be formulated as the provision of an alternative biodegradable chelating agent to be used in the pre-

treatment step of a process for the bleaching of mechanical pulp or recycled fiber;

- document (3) related to the bleaching of a wood pulp which was a mechanical pulp of the type treated in the patent in suit (in this respect the wording "high yield" in the claim of the patent in suit had no limiting effect and just qualified any type of mechanical pulp or recycled fiber); this document disclosed the use in the bleaching of biodegradable chelating agents falling under the formula of the patent in suit, which chelating agents were more efficient than **DTPA** in stabilizing hydrogen peroxide at alkaline pH; therefore, it would have been obvious for the skilled person to try them also in the pre-treatment step of the process disclosed in document (2);

- as indicated in paragraph 3 of the patent in suit, the step of compressing the pulp after pre-treatment to higher consistency was already part of the common general knowledge of the skilled person; moreover, document (2) already disclosed the step of increasing the consistency of the pre-treated pulp before bleaching and document (8) taught that such a step could be carried out by compressing the pulp on a filter;

- the use of citric acid for replacing part of the main chelating agent used in the pre-treatment step was already known from document (2);

- document (1) taught that **EDDS** could be used as biodegradable chelating agent for heavy metals in order to stabilize hydrogen peroxide in the bleaching of wood

pulp and showed that **EDDS** was even better than ethylene diamine tetra acetic acid (**EDTA**); therefore, it would have been also obvious for the skilled person to try **EDDS** as an alternative to the phosphonate chelating agents of document (2);

- therefore, all requests lacked an inventive step.

VIII. The Appellant requested in writing that the decision under appeal be set aside and that the patent be maintained with the claims as granted (main request) or, in the alternative, with any of the sets of claims according to the auxiliary requests 1 to 4 submitted with the grounds of appeal.

IX. The Respondent 02 requested that the appeal be dismissed.

Reasons for the Decision

1. Main request (patent as granted)

1.1 Inventive step

1.1.1 The present invention concerns a process for the bleaching of a high yield pulp, wherein, before peroxide bleaching, the pulp is pre-treated with a chelating agent in order to eliminate the adverse effects of any heavy metal present in the pulp (see paragraph 1 of the patent in suit); as defined in the patent in suit, the wording "high yield pulp" means mechanical pulp or recycled fiber (see paragraphs 2 and 25 of the patent in suit).

As explained in the description of the patent in suit, hydrogen peroxide is commonly used for the bleaching of mechanical pulps and recycled fibers; however, such pulps and fibers and the water used in their preparation contain heavy metals which catalyze the decomposition of hydrogen peroxide; hence, specific stabilizing agents such as chelating agents for the heavy metals, like **EDTA** and **DTPA**, are commonly added during the alkaline bleaching step in order to stabilize the peroxide (see paragraphs 6 to 9).

Moreover, the bleaching of mechanical pulps is carried out currently in two steps in order to obtain higher pulp brightness and it is common to add such chelating agents during the pre-treatment step carried out at a pH lower than that at which the actual bleaching takes place (paragraphs 13 and 14).

However, chelating agents like **EDTA** and **DTPA** are non-biodegradable or only poorly biodegradable (see paragraph 10).

Therefore, according to the description, the technical problem underlying the invention is considered to be the provision of alternative chelating agents for such a two-steps bleaching process, which chelating agents are biodegradable and lead to a good bleaching performance, i.e. a brightness result and a peroxide stabilization which is comparable to that achieved by means of the poorly biodegradable **DTPA** (see paragraph 21 in combination with paragraphs 55 and 57).

1.1.2 All parties agreed that document (2) represents the closest prior art. In fact, similarly to the patent in suit, this document concerns also the provision of an alternative chelating agent for a two-steps process for bleaching mechanical pulp, which chelating agent is biodegradable and performs at least so well as **EDTA** and **DTPA** in terms of brightness result and peroxide stabilization (see document (2), page 1, lines 7 to 10 in combination with page 7, lines 1 to 6 and 23 to 25; page 3, lines 1 to 14 and 22 to 26 as well as page 6, lines 20 to 26 and page 7, lines 10 to 16).

Therefore, the Board has no reason to depart from the finding of the Opposition Division that document (2) represents the most suitable starting point for the evaluation of inventive step.

1.1.3 The Appellant, by referring to the tests presented as annex 1, submitted that the chelating agents according to claim 1 of the main request bring about an improved bleaching performance in terms of brightness and efficacy.

However, the Board remarks that the comparative bleaching experiments, the results of which are outlined in table 3 of annex 1, compare a two-steps process of the invention wherein **EDDS** or **ISA** are used as chelating agents in the pre-treatment step with a process wherein such chelating agents are added to the alkaline bleaching step only and in a first step the pulp is treated at a lower pH without any chelating agent.

The tests of annex 1 thus do not contain any comparison with a process according to document (2), which, as admitted by the Appellant (see point VI(a) above), differs from that claimed in the patent in suit only insofar as a different chelating agent (a biodegradable phosphonate) is used in the pre-treatment step (see e.g. example 5 of document (2)).

Moreover, these tests do not contain any comparison with a process using the non-biodegradable **DTPA** which, as explained in point 1.1.2 above, brings about a similar bleaching performance as the biodegradable phosphonate chelating agents of document (2) and hence could also be considered a suitable term of comparison.

To the contrary, the tests contained in the patent in suit show that the selected chelating agents of claim 1 bring about a bleaching performance comparable to that obtained by using **DTPA** (see paragraphs 51, 53, 55 and 57 of the patent in suit), i.e. a bleaching performance which is also comparable to that obtained by means of the biodegradable phosphonates of document (2).

The Board remarks also that the other tests contained in annex 1 (and also in example 6 of the patent in suit) regard only the hydrogen peroxide stabilisation at alkaline pH by means of the selected chelating agents of claim 1 but not the bleaching performance of a two-steps process as claimed wherein the chelating agents are used in the pre-treatment step.

Therefore, the Board finds that no evidence has been submitted showing that the alleged improvement in bleaching performance over the closest prior art has been effectively achieved. This alleged improvement

thus has to be disregarded in the formulation of the technical problem underlying the invention.

- 1.1.4 In the Board's view, the technical problem underlying the invention in the light of the teaching of document (2) can only be formulated as the provision of alternative biodegradable chelating agents for use in the pre-treatment step of a two-steps mechanical pulp or recycled fiber bleaching process, which chelating agents bring about a bleaching performance in terms of brightness and peroxide stabilization similar to that obtained by means of the biodegradable phosphonates of document (2) or of **DTPA**.

In the light of the comparisons with **DTPA** contained in the patent in suit already discussed above, the Board has no reason to doubt that the technical problem mentioned above has been successfully solved by means of the subject-matter of claim 1.

- 1.1.5 As already mentioned above, the process disclosed in document (2), e.g. in example 5 thereof, differs from that of claim 1 of the patent in suit only insofar as a different chelating agent (a biodegradable phosphonate) is used.

It is undisputed that document (3) discloses biodegradable chelating agents, the generic formula (I) of which encompasses chelating agents falling within the generic formula (I) of the patent in suit and their use in the bleaching of wood pulp with hydrogen peroxide (see each claim 1 of document (3) and of the patent in suit).

Moreover, this document concerns specifically the bleaching of pulp obtained by means of a classical grinding or refining process, i.e. the bleaching of high yield mechanical pulp (see document (3), page 1, first paragraph below "Stand der Technik" and page 3, first paragraph below "Beschreibung der Erfindung" and the patent in suit, paragraph 25).

Document (3) teaches also that the selected class of chelating agents is biodegradable and provides a very good and better peroxide stabilization than **DTPA** (see page 5, lines 9 to 12 and page 8, tables 1 and 2).

Even though, as submitted by the Appellant, citric acid was also already known as possible alternative biodegradable chelating agent for such a pre-treatment step (see document (7), claims 1 and 2 or document (8), claims 1, 8 and 9), it was also known that citric acid is a weak chelating agent and had to be used at great amounts, if used alone; therefore, its use was not considered in the prior art to be economically acceptable (document (7), column 1, lines 31 to 39).

Consequently, in the light of the teaching of the prior art, the skilled person would have chosen as alternative biodegradable chelating agent one as disclosed in document (3) rather than citric acid.

1.1.6 Moreover, because of their known capability of stabilizing hydrogen peroxide better than **DTPA**, the skilled person would have tried the chelating agents of document (3) not only in the alkaline actual bleaching explicitly mentioned in this document, but also in the pre-treatment of a known two-steps bleaching process of

the prior art which was commonly used for increasing the brightness of mechanical pulps (see paragraphs 13 and 14 of the patent in suit and document (2), page 7, lines 1 to 4).

Therefore, starting from the teaching of document (2), it thus would have been obvious for the skilled person faced with the technical problem mentioned above, to try the known biodegradable chelating agents of document (3) in a process as disclosed in example 5 of document (2).

1.1.7 The Board thus concludes that the subject-matter of claim 1 according to the main request lacks an inventive step.

2. Auxiliary request 1

2.1 Claim 1 of the set of claims according to the auxiliary request 1 differs from claim 1 as granted only insofar as it requires the further step of compressing the pretreated pulp to the consistency used in peroxide bleaching.

2.2 The Board remarks that in example 5 of document (2) the pulp consistency is indicated to be only 5% in the pre-treatment step whilst it is 15% in the subsequent bleaching step. Therefore, in this known process the consistency of the pulp was increased between the pre-treatment and the bleaching step by removing liquid.

Moreover, it was known from document (8) that the consistency of a pre-treated pulp can be increased before bleaching by pressing it on a filter in order to

remove so much liquid is possible (see column 2, lines 61 to 65). The same patent in suit confirms that such a process step was conventional for the two-steps bleaching of mechanical pulps (see paragraph 3 of the patent in suit).

Therefore, it would have been obvious for the skilled person to increase the consistency of the pre-treated pulp in a process like that of example 2 of document (2) by pressing the pulp on a filter as suggested in document (8).

Furthermore, since it was known that the chelating agents present in the pre-treatment step form heavy metal complexes, the skilled person would have also expected that such a liquid removal step after pre-treatment reduces the amount of heavy metals capable of catalyzing the decomposition of hydrogen peroxide in the following bleaching step.

2.3 Therefore, the subject-matter of claim 1 according to auxiliary request 1 lacks an inventive step.

3. Auxiliary request 2

3.1 Claim 1 of the set of claims according to the auxiliary request 2 differs from claim 1 as granted insofar as the chelating agent is **EDDS** or **ISA** and is used together with a hydroxycarboxylic acid having the formula (II)



where n is 1-8, m is 0-2n, p is 0-n, q is 0-2, R₁ is COOH, and R₂ is H, CH₂OH or COOH,

for example, citric acid.

- 3.2 As already explained in point 1.1.6 above, it would have been obvious for the skilled person to try any chelating agent falling under the formula of document (3) in the process disclosed in example 5 of document (2).

It is undisputed that formula (I) of document (3) also encompasses **ISA**, i.e. one of the chelating agents required by claim 1 according to auxiliary request 2.

The Board remarks that the Appellant demonstrated in annex 1 and in example 6 of the patent in suit that **ISA** is not a good chelating agent at alkaline pH and argued that the skilled person thus would not have tried such a chelating agent as alternative to the phosphonates of document (2).

However, the Board notes that the Appellant's finding is not part of the teaching of the prior art, which taught conversely that the class of chelating agents including **ISA** was superior to **DTPA**.

Therefore, in the Board's judgement, the skilled person would not have found in the prior art any teaching deterring him from trying **ISA** in a process as disclosed in document (2).

- 3.3 Moreover, document (2) suggested explicitly to use the main chelating agent of the pre-treatment step in combination with other known biodegradable chelating agents such as citric acid in order to replace a

portion of them and provide a more environmentally friendly chelating system not containing phosphorous (see page 9, lines 5 to 11).

Therefore, it was also obvious for the skilled person, to try similarly a chelating agent of document (3) such as **ISA** in combination with citric acid in order to reduce any possible detrimental environmental impact, like the presence of known polluting nitrogen in effluents.

3.4 The subject-matter of claim 1 according to auxiliary request 2 thus lacks an inventive step.

4. Auxiliary request 3

Claim 1 of the set of claims according to the auxiliary request 3 differs from claim 1 according to auxiliary request 2 in the same way as claim 1 of the set of claims according to the auxiliary request 1 differs from claim 1 as granted.

Therefore, the same reasons put forward with respect to auxiliary request 1 apply *mutatis mutandis* to auxiliary request 3.

5. Auxiliary request 4

5.1 Claim 1 of the set of claims according to the auxiliary request 4 differs from claim 1 according to the auxiliary request 3 only insofar as the chelating agent is **EDDS**.

The use of **EDDS** as chelating agent is not disclosed in document (3).

However, it was already known from document (1) that **EDDS** is a suitable biodegradable chelating agent for heavy metals for stabilizing hydrogen peroxide, that it performs better than **EDTA** and that it can be used at alkaline and acid pH (see page 3, lines 14 to 27; page 4, last paragraph; page 5, first paragraph). Furthermore, document (1) teaches that **EDDS**, because of its technical properties, can be used in the bleaching of wood pulp (see page 11, lines 6 to 9). In this respect it is clear from the overall teaching of this document that wood pulp bleaching includes the treatment of mechanical pulp obtained by mechanically treating wood chips (see page 2, lines 13 to 16).

Therefore, even though this document does not disclose explicitly the use of **EDDS** in a two-steps process for bleaching mechanical pulp, it would have been obvious for the skilled person, in the light of the overall teaching of document (1), that this biodegradable chelating agent having better properties than **EDTA**, must also have similar properties as the phosphonate chelating agents used in document (2) which are considered to be comparable to **EDTA** and **DTPA** (see page 6, lines 20 to 22 of document (2)).

- 5.2 Moreover, even though the Appellant demonstrated in annex 1 and in example 6 of the patent in suit that **EDDS** is not a good hydrogen peroxide stabilizing agent at alkaline pH and argued that the skilled person thus would not have tried such a chelating agent as alternative to the phosphonates of document (2), the

Board remarks that document (1) had already taught that **EDDS** was in principle a weak chelating agent at alkaline pH (see passage bridging pages 3 and 4). However, document (1) taught also that **EDDS** becomes a chelating agent performing better than **EDTA** when used at a temperature of 60°C or higher (see page 4, lines 7 to 10; page 7, lines 4 to 6), i.e. at a temperature which can also be used in the pre-treatment step of the claimed process as shown in examples 3 to 5 of the patent in suit wherein temperatures of 60 or 70°C are used or in document (2) wherein example 5 uses temperatures of up to 90°C in the pre-treatment step (see page 20).

Therefore, in the Board's judgement, the skilled person would not have found in the prior art any teaching deterring him from trying **EDDS** in a process as disclosed in document (2).

- 5.3 The Board thus finds that, starting from the teaching of document (2), it would have been obvious for the skilled person faced with the technical problem mentioned above, to try these known biodegradable chelating agents, because of their known technical properties, in the pre-treatment of the two-steps process of example 5 of document (2) (see also the similar conclusion in point 1.1.6 above).

Moreover, the skilled person would have tried **EDDS** in combination with citric acid for the same reasons indicated in point 3.3 above.

5.4 The Board thus concludes that claim 1 according to the auxiliary request 4 does not amount to an inventive step.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

D. Sauter

P.-P. Bracke